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AGRICULTURAL NEWS LETTER

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This publication contains information regarding new developments of interest to agriculture based on laboratory and field investigations of the du Pont Company and its subsidiary companies. It also contains published reports and direct contributions of investigators of agricultural experiment stations and other institutions as related to the Company's products and other subjects of agricultural interest.



AGRICULTURAL NEWS LETTER

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AGRICULTURE AT DU PONT WORLD'S FAIR EXHIBIT

Chemistry's contributions to agriculture are depicted at the Du Pont World's Fair exhibit this year as exercising a notable influence on the nation's farm economy. Conquest of the insect menace, progress toward eliminating plant disease, the insurance of an adequate fertilizer supply and other advances are demonstrated to show what happens when science puts on overalls and goes back to the soil.

The exhibit emphasizes the importance of research in enriching the harvest through efficient farm procedure. It comments also on the chemurgic movement, pointing out the swelling tonnage of farm products finding a way to market in industry. Giant wall displays feature the agricultural materials such as vegetable oils, cotton and other crops, which flow in increasing streams from field to factory. Reference is included to the fertilizers, insecticides, explosives for field clearing, wood-treating chemicals, vitamins and similar articles making the return trip in a vast alliance of reciprocal trade.

One of the major attractions is the pest control exhibit. It has been enlarged and expanded from last year. Seed treatment is a phase of this work added. A scale model of a rotary-type seed treater is shown, demonstrating the ease and rapidity of treatment with organic mercury disinfectant powders. Benefits of seed treatment are shown in glass petri dishes.

The pest control "laboratory" last year proved one of the most popular exhibits. More than 50,000 specific inquiries were directed at Dr. M. D. Leonard, entomologist in charge, and his staff. Thousands of native New Yorkers, to whom codling moths and corn borers represented species as strange as dragons, marveled at the display. Among the other transitory insect guests this year are Japanese and Mexican beetles, termites, army worms, boll weevils and the ubiquitous house fly.

Another part of the exhibit shows the making of ammonium carbamate, from which crystal urea is derived. Crystals form dramatically in snow-like drifts from a mixture of gases inside a glass cylinder. Lecturers comment on the display, explaining its significance in developing a domestic source of efficient low-cost fertilizers.

The vital character of the agricultural problem is examined both scientifically and economically. The exhibit shows what has been done thus far and hints at what may be reasonably expected in the husbandry of tomorrow. Soil chemistry progress, the eventual prevention of all plant disease, advance in plant genetics and the final triumph over weeds and harmful insects are indicated as a part of the broad program in prospect for the future.

As was the objective during the successful 1939 season, the "Wonder World of Chemistry" translates the liason of science and the soil in simple average-man terms. The economy of the future, it is pointed out, lies in the laboratory. Chemistry's place in that future grows more significant every day.

Last year the Du Pont exhibit ranked as one of the top Fair attractions, receiving more than five million visitors.

CONSUMPTION OF FERTILIZER NITROGEN
IN THE UNITED STATES

Editor's Note:- The results of research and industrial and agricultural progress are frequently reflected by statistics. An excellent example of this is the statistics on the consumption of different forms of fertilizer nitrogen in the United States. The accompanying article indicates the great changes that have taken place in agricultural practice and in our nitrogen fertilizer industry during the past several decades.

By F. W. Parker
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Statistics on the consumption of fertilizer materials in the United States have been rather incomplete and unsatisfactory for many years. This situation is being corrected by studies of the Division of Fertilizer Investigations of the United States Department of Agriculture. Mehring* has published data on the consumption of fertilizer materials in the United States for the period 1850 to 1937. These data, with some additional data on the nitrogen content of organic materials also furnished by Mehring, are the basis for the material presented in this article.

The data are expressed as short tons of nitrogen and include consumption in Hawaii and Puerto Rico as well as consumption in continental United States.

Total Nitrogen Consumption

The consumption of fertilizer nitrogen was very small and increased slowly from 1850 to 1880. Consumption then approximately doubled every ten years for the next three decades and reached 130,000 tons nitrogen in 1910. The increase continued to 202,000 tons in 1920, 347,000 tons in 1930, and 433,000 tons in 1937. There was, of course, a sharp drop in consumption during the depression with a low of 233,000 tons in 1932. These data, and the trend of consumption are clearly shown in Figure 1.

Inorganic and Organic Nitrogen

In addition to giving the total consumption of nitrogen, Figure 1 shows the consumption of organic and inorganic nitrogen. The latter includes synthetic organics such as cyanamide and urea. In 1900 inorganic sources of nitrogen

*Mehring, A. L. "The Magnesium Content of Fertilizers, 1850-1937"
1939 Yearbook Commercial Fertilizer

Fig. 1

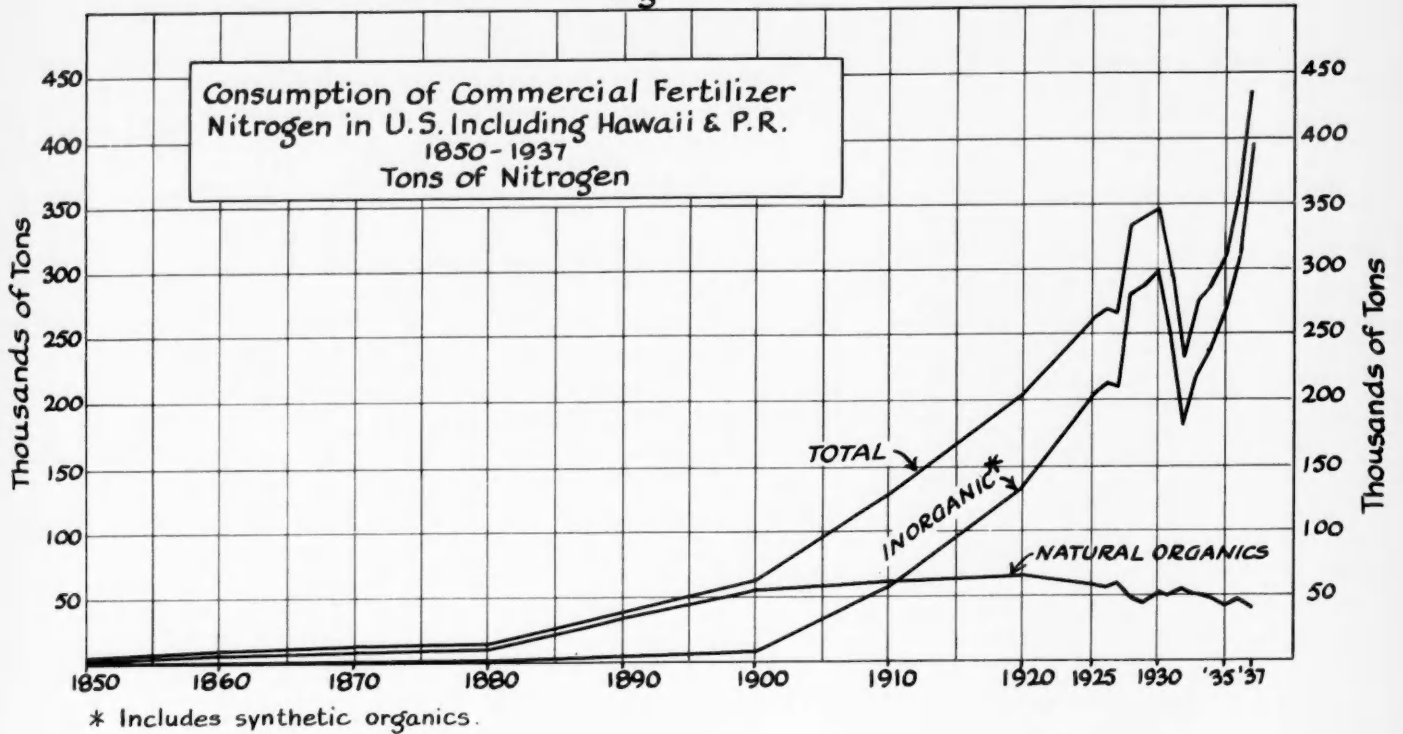
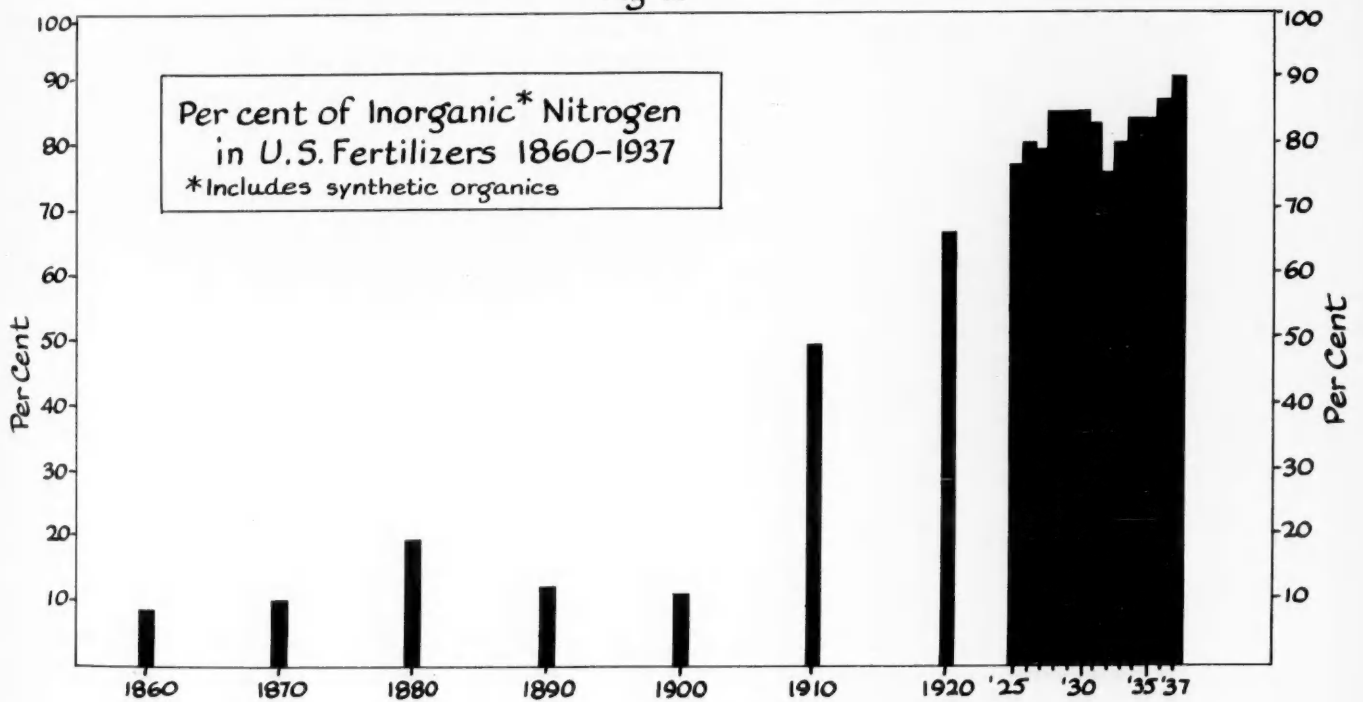


Fig 2



were unimportant and furnished only 11 per cent of the nitrogen used in fertilizers. It was not until 1910 that consumption of inorganic nitrogen reached as high a level as the organics. Since 1910 the inorganics have furnished an increasingly higher percentage of the total nitrogen, as shown in Figure 2. In 1937 approximately 90 per cent of the total nitrogen used in fertilizers was from inorganic and synthetic organic sources.

Figure 1 shows that the maximum tonnage of organic nitrogen, 67,000 tons, was used in 1920. The tonnage has subsequently declined nearly 40 per cent to 50,000 tons in 1930 and approximately 41,000 tons in 1937. During the same 17-year period, the consumption of inorganic sources has gone from 134,000 tons to 392,000 tons, an increase of 190 per cent.

Forms of Organic Nitrogen

Utilizing Mehring's data, the sources of organic nitrogen used in fertilizers have been grouped into several classes shown in Figure 3. The vegetable proteins include all oil seed meals and cocoa by-products. The animal proteins include dried blood, animal tankage and all fish products. The vegetable and animal protein materials were the only important source of organic nitrogen as late as 1920 when they furnished 88 per cent of the organic nitrogen. In 1930 and 1937 less than 60 per cent of the organic nitrogen was derived from materials classed as animal and vegetable proteins.

The production of process tankage started about 1910. After 1920 production increased rapidly to a total of 10,000 tons nitrogen in 1925. Production has remained at about that level, except during the depression years when it went as low as 3,400 tons nitrogen in 1932, but was back to nearly 10,000 tons nitrogen in 1937. In the latter year almost one-fourth of the organic nitrogen used for fertilizers was derived from process tankage. In that year it furnished almost as much nitrogen as did the animal or vegetable proteins.

The first indicated use of sewage sludge for fertilizers was in 1927. Consumption has increased from 1,100 tons nitrogen in that year to 4,400 tons nitrogen in 1937. In the latter year it furnished 10 per cent of the total organic nitrogen. This promises to be an increasingly important source of organic nitrogen, especially since Chicago has started large-scale production of sewage sludge.

Forms of Inorganic Nitrogen

The inorganic nitrogen materials have been placed in four classes: (1) nitrates, including all solid nitrates; (2) ammonium salts, including the ammonium nitrogen in materials containing both ammonium and nitrate nitrogen; (3) synthetic organics, cyanamide and urea; (4) ammonia liquors, by-product and synthetic. The ammonia liquors contain ammonium, nitrate and urea nitrogen but it has seemed best to group them separately rather than break the tonnage down to the three major forms of soluble nitrogen. Well over half of the nitrogen in ammonia liquors, however, is in the ammonium form.

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Fig. 3

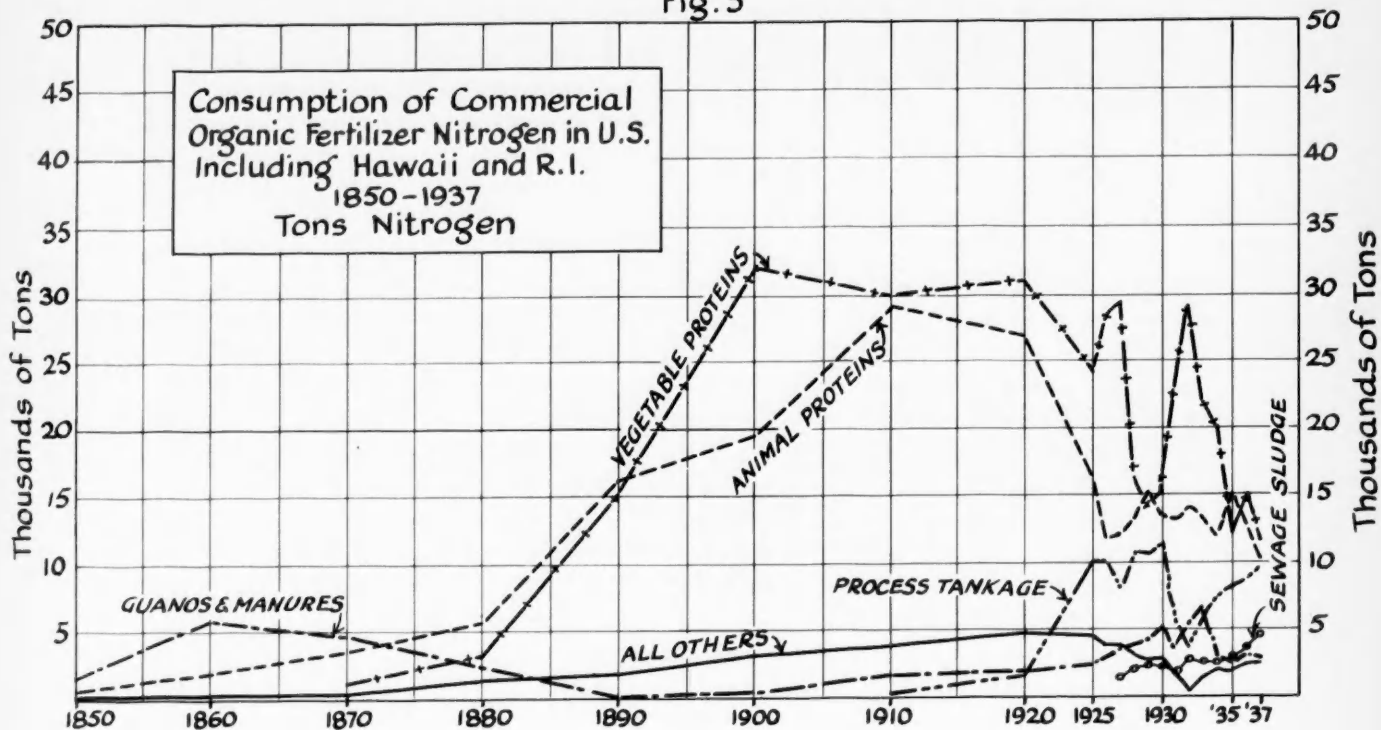
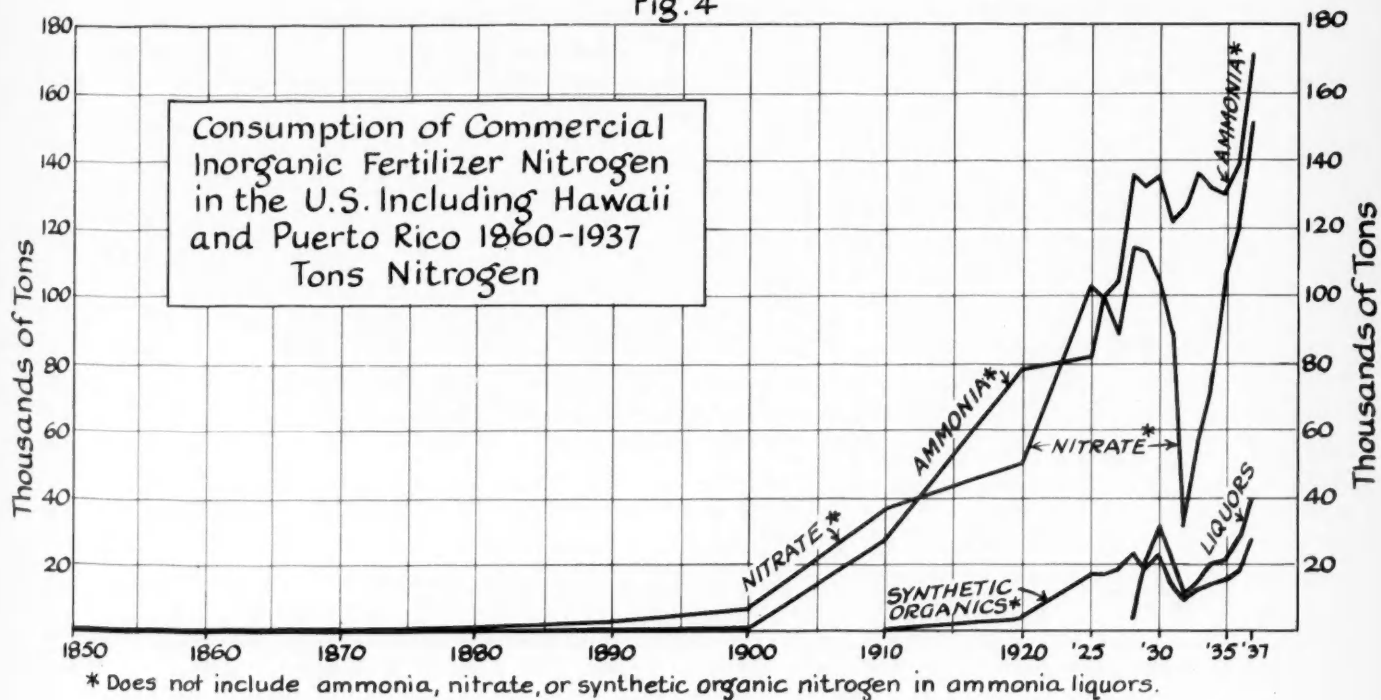


Fig. 4



The consumption of the four forms or classes of soluble nitrogen is shown in Figure 4. Sodium nitrate was the only important source of soluble nitrogen up to and including 1900. Beginning with 1910, ammonium salts became an important source of fertilizer nitrogen. Since 1910 the tonnage of nitrogen used as ammonium salts has nearly always exceeded the tonnage of nitrate nitrogen.

The consumption of synthetic organic nitrogen started about 1910 with the production of Cyanamid and reached a tonnage of nearly 25,000 tons nitrogen in 1928 and 1930. Following a decrease during the depression, consumption reached a new high of 27,000 tons in 1937. This class of nitrogen materials may become more important with the recent domestic production of a urea-containing fertilizer material.*

Ammonia liquors for the ammoniation of superphosphate were first extensively used in 1928 but consumption increased to an estimated 31,000 tons in 1930. Consumption in 1937 was about 40,000 tons, approximately 10 per cent of the soluble nitrogen used in fertilizers. The ammonia liquors will probably be increasingly important sources of nitrogen although there are more limitations on the use of liquors than is the case with solid fertilizer materials.

Price of Nitrogen and Changes in Consumption

The indicated increase in consumption as well as shifts in forms of nitrogen are, in part, the result of changes in the cost of nitrogen. This subject cannot be adequately treated in this article. It is, however, of interest to note that the price of inorganic nitrogen dropped approximately 30 per cent in the period 1880 to 1925. Since 1925 there has been a further reduction of nearly 50 per cent in the wholesale price of inorganic and synthetic organic sources of nitrogen. These drastic price changes undoubtedly were a major factor in promoting the increased consumption of nitrogen fertilizers.

*"Uramon" fertilizer compound, 42% urea nitrogen, a product of the Ammonia Department, E. I. du Pont de Nemours & Co.

KNOTS FOR NYLON LEADERS

Editor's Note: Through long experience with those who are connected with research work, it is generally known that many of them are enthusiastic fishermen. It is thought they will be interested in the following results of a very satisfactory piece of research work.

Research supports the opinion widely held by fishermen that the "Turle," the "Figure Eight," and the "Return" knots are the most dependable for tying flies to the tippet end of the new nylon leaders.

Numberless types of knots have been tied and tested at the Arlington, N. J., Research Laboratories of the Du Pont Company's Plastics Department, where the leader material is manufactured.

None showed the staying power of these three knots, which long have been favorites with fishermen. Results of the research were checked with authorities on knots and with experienced fishermen.

The three knots which stood up best under the tests were easier to tie than practically any knots known. They were found to be the best solution to the problem of fishermen who preferred nylon leaders but found that the old over-hand jam knot lacked sufficient strength in the new material to guarantee the absolute security desired.

Stresses greater than any that could be encountered in angling were placed on all three knots without the hint of a tendency to slip. The daintiest trout flies and the largest salmon and bass flies were tied securely with all three.

The Turle is tied by making a simple slip knot after the leader tippet has been passed through the eye of the fly hook. When the slip knot is tied up tightly, the large loop is passed over the fly and the whole pulled tight into a sure grip.

In the Figure Eight, or "Wemyss" knot, the tippet end is passed through the hook eye then looped back around the standing part of the leader. The end is carried over to form a second loop and forward again to pass through the first loop. This operation forms a figure eight around the standing section.

The figure eight is drawn close to the eye of the hook and just before the loop closes it is pushed over the eye with the thumb.

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The Return knot is more difficult, but was found to be exceptionally strong. The leader is passed through the eye of the hook, down behind the hook and up the front to form one loop over which a second turn forms another, both being held open with the thumb and forefinger. The end then is passed around the standing part of the leader and back under both loops, which must be pushed over the eye as the knot is drawn tight.

Extensive field tests showed that the barrel knot was entirely satisfactory for tying strands of nylon together.

Nylon leader material is entering its second year of general use. Du Pont officials said fishermen who used it the first year were especially interested in its strength and low visibility in water.

The material is made in mechanically controlled uniform diameter. It has less sheen than natural gut and, being a monofilament, will not fray or split.

Fishermen commented widely on the fact that nylon does not have to be soaked before being used, can be tied dry and cast dry without waiting, and will straighten easily while dry.

PAINT FOR FARM BUILDINGS

Editor's Note: Data obtained from Ruby M. Loper, Assistant Extension Agricultural Engineer, University of Nebraska show that Nebraska farm buildings need for repair work alone 270,000 gallons of paint on the outside and 122,000 gallons on the inside. In this, no new houses were considered and no remodeling was included. Nebraska has approximately 2% of the farms in the United States. It is plain to be seen that the amounts of paint actually needed on American farms is staggering in size.

A ten-year program of research in exterior paints made by chemists of the Du Pont Company was climaxed recently in the announcement of improved house paints which literally "wash" themselves under the action of rain, wind and sun.

The survey covered the entire range of modern house paint evolution. This included the early lead and oil paints, lead-zinc combinations, the lithopone paints, and particularly the newer type paints containing titanium oxide. It was conducted by chemists of the Du Pont Research Laboratory.

The new Du Pont House Paint was found to keep itself cleaner and in better condition than most of the paints tested. It does this by accumulating a fine powder on the surface. As dust and dirt from the atmosphere settle on this surface, they are readily washed away by wind and rain, exposing fresh, clean paint. This is a peculiar characteristic of a relatively new type of pigment, based on the metal titanium. Only a tiny bit of paint is washed off each time this phenomenon occurs leaving the finish well protected.

Paints of the older type tend to collect and hold dust and dirt from the atmosphere and to grow dirty. Du Pont's new House Paint which, contains titanium, the laboratory study reveals, keeps itself cleaner and, as it ages, presents a better surface for repainting. The process by which these benefits are acquired, it was said, is known as "controlled chalking."

The studies, conducted with hundreds of houses and exposure tests of many thousands of panels, were made in Delaware, Florida, and Texas to provide a wide climatic range. They established that titanium pigment as used in the new Du Pont House Paint "exhibits properties far superior to those of any older type pigments."

All types of paints were included in the investigation. In many instances half of a structure was painted with one paint, while the other portion received a comparable finish of a different type. Results were scientifically tabulated

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at frequent intervals. It is emphasized that the survey was undertaken in an unbiased effort to evaluate the relative merits of various materials available to the industry.

According to Du Pont's chemists, titanium is found in combination with other materials in many parts of the world. The metal titanium has also been used for some time in steel manufacture. Titanium oxide, produced by the chemical treatment of certain of the natural ores, has recently taken a highly important place among paint pigments because of its outstanding whiteness and opacity.

Another new and interesting development of the Du Pont research laboratories is a clear wood finish, which penetrates into the pores and becomes an actual part of the wood. It is designed primarily for new, wood floors, but may be employed on interior woodwork, trim, and paneling. The finish is described as producing satisfactory and durable results with less labor and expense than older type finishes. It can be used in farm homes, schools, gymnasiums, and industrial plants.

The finish sinks deeply into the wood, filling the pores and binding the wood fibers together. Through the addition of oils and resins, it is said to impart to the wood marked toughness and resistance to wear. It differs from old-type materials in that it leaves almost no surface film.

The material contains a moisture-proof composition preventing accumulation of dust and dampness. Wood surfaces so protected do not turn white upon contact with water. The new finish also practically eliminates scraping or sanding when it is necessary to renew the fine appearance of the floor.

If applied in the clear state, it gives a finish slightly darker in color than that of white shellac. Color effects may be obtained by adding an oil stain to the first coat, to give any desired depth of tone. The stain does not destroy its transparency or any of the original characteristics of this new finish.

DRIVING POSTS OR PILING WITH DYNAMITE

On many occasions it is essential to put a piling or post in water or wet ground where a pile driver is not available, particularly when just a few piling are to be driven, which would not warrant bringing in a heavy piece of equipment.

A method has been worked out whereby the force of dynamite can be used to transmit a blow which is somewhat similar to the dropping of a pile driver hammer. The pile is stood upright in the location desired, and braced in place - usually with rope. The head of the pile should be sawed off square, and the procedure is to put a heavy plate of steel on top of the pile. To give the best results, the plate should be 1" to 1-1/2" thick. One stick of dynamite is placed on top of the plate, and covered with mud, after the stick has been properly primed with a blasting cap and fuse or an electric blasting cap. When the charge is exploded the force is transmitted to the plate which in turn transmits it to the pile. The pile is driven into the ground sometimes as much as 14", if the ground is soft. The procedure is then repeated until 1" penetration per explosion is obtained.

If the top of the pile is not square, or if there are some flaws in the wood near the top, a brooming or split effect usually takes place. Hence it is advisable to have about 4 ft. extra length which can be sawed off after complete penetration is obtained.

While this procedure is not an economical one, provided a pile driver is available, it does provide a new method for putting individual piles or heavy posts in the ground in a very solid compact manner.

The Engineering Division of the United States Forest Service completed some comparative tests between dynamite and a pile driver for this work.

Piles of a standard size were put down with a regular pile driver then similar piles were put down with dynamite shots until the penetration was equal.

Various loads of dynamite were used and results indicated that in general one stick of 50% Straight N.G. Dynamite weighing 1/2 lb. was the maximum load to use.

Further information on this work can be obtained from the United States Forest Service.

NEW BOOKLET - DU PONT'S PARTNERSHIP WITH THE FARMER

The value of scientific research to the farmer, both in the things he buys and the things he sells, is demonstrated in a new booklet, "Du Pont's Partnership With The Farmer," just published by E. I. du Pont de Nemours & Company, Inc.

Although this booklet does not stress research as such, it shows clearly that both products for the farm and those made from farm products would not be available had it not been for chemical research.

"Picture, if you can," says the booklet, "a mammoth freight train of 6,875 twenty-ton box cars stretching out over 52 miles of right-of-way. Such a train as this would have been needed to haul the cotton, wood pulp, corn products, vegetable oils, turpentine, and rosin purchased by Du Pont in the single year 1939."

The booklet also shows how many farm products, after the manufacturing process, go back to the farm, either for direct use such as wood and metal finishes, clothing and household articles, or as aids in the preservation and marketing of other farm products, such as "Cellophane" cellulose film, and "Cel-O-Seal" cellulose bands for sealing bottles and jars and "Cel-O-Glass" for windows in poultry houses.

Other products of Du Pont mentioned in the booklet as of direct aid to the farmer, some of which have at least a part of their origin in products of the farm, are paints, chemicals for seed-treating and fumigation, agricultural explosives, fertilizer ingredients, insecticides and fungicides, wood preservatives, and cutlery.

This booklet may be obtained by request from the Editor Agricultural News Letter.
